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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/795,557	03/12/2013	Yohei TAKADA	7991-000046/US	1656

27572 7590 02/01/2017
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EXAMINER

YANG, ZHEREN J

ART UNIT	PAPER NUMBER
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1781

NOTIFICATION DATE	DELIVERY MODE
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02/01/2017

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte YOHEI TAKADA and YOSHIFUMI ITO

Appeal 2015-006343
Application 13/795,557
Technology Center 1700

Before: LINDA M. GAUDETTE, WESLEY B. DERRICK, and
AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellants² appeal under 35 U.S.C. § 134(a) from a rejection of claims 1–6. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In our Decision below we refer to the Specification filed March 12, 2013 (Spec.), the Final Office Action mailed April 11, 2014 (Final Act.), the Appeal Brief filed October 27, 2014 (Appeal Br.), the Examiner's Answer mailed April 10, 2015 (Ans.), and the Reply Brief filed June 10, 2015 (Reply Br.).

² Appellants identify the real party in interest as Daido Metal Company Ltd. Appeal Br. 1.

STATEMENT OF CASE

The claims are directed to a resin sliding member including crystalline CaF_2 where the “peak intensity of a (111) plane of the calcium fluoride exposed on a sliding surface is larger than a peak intensity of a (220) plane. Spec. 2–3. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A resin sliding member, comprising:
0.5 to 25 vol% of calcium fluoride dispersed as particles; and
a polyether ether ketone resin as a remainder,
wherein the calcium fluoride is crystalline,
the particles are oriented such that many (111) cleavage
planes of the calcium fluoride exist on surfaces thereof, and
a peak intensity of a (111) plane of the calcium fluoride
exposed on a sliding surface is larger than a peak intensity of a
(220) plane.

Claims Appendix at Appeal Br. 23.

REJECTIONS

The Examiner maintains the following rejections:

- A. Claims 1–5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori³ in view of Kamiya⁴ and Roy⁵ as evidenced by Nabot⁶ or Gardos.⁷ Final Act. 2–3.

³ Mori et al., US 5,039,575, issued August 13, 1991 (“Mori”).

⁴ Kamiya et al., WO 2011/111668, relying on use of its English language equivalent US 2012/0270761 A1, published October 25, 2012 (“Kamiya”), which use is not contested.

⁵ Roy et al., US 2009/0053976 A1, published February 26, 2009 (“Roy”).

⁶ Nabot et al., *Cathodic Sputtering for Preparation of Lubrication Films*, SURFACE AND COATINGS TECHNOLOGY (1990) 629–639 (“Nabot”).

⁷ Gardos et al., *Determination of Tribological Fundamentals of Solid Lubricated Ceramics Volume 1: Summary*, MATERIALS LABORATORY

- B. Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori, Kamiya, and Roy as evidenced by Nabot or Gardos and further in view of Kim.⁸ *Id.* at 6.

Appellants seek our review of rejections A–B. Appellants argue claim 1 and do not present any argument, separate from what is argued for claim 1, for claims 2–6. *See generally* Appeal Br. 7, 19, and 20. Therefore, we focus our discussion on claim 1 (Rejection A) to resolve the issues on appeal.

After consideration of the evidence on this appeal record and in light of the respective positions advanced by the Examiner and Appellants, we are unpersuaded that the Examiner erred reversibly in determining that the applied prior art renders the subject matter of claims 1–6 obvious. Accordingly, we sustain the Examiner’s rejection under 35 U.S.C. § 103. We add the following primarily for emphasis.

OPINION

The Examiner rejects claim 1 as unpatentable over Mori in view of Kamiya and Roy as evidenced by Nabot or Gardos. Final Act. 3. The Examiner finds Mori teaches a sliding member comprised of a polyether ketone, specifically PEEK (polyether ether ketone), and 1–35 wt. % of a metal fluoride, e.g., CaF₂. *Id.* (citing, *inter alia*, Mori col. 1, ll. 63–67, col. 2, ll. 1–2, 15–19, col. 3, ll. 1–7). The Examiner acknowledges that Mori

WRIGHT RESEARCH AND DEVELOPMENT CENTER, November 1990 (“Gardos”).

⁸ Kim et al., US 7,491,353 B2, issued February 17, 2009 (“Kim”).

does not teach the crystalline orientation of the CaF_2 particles on the surface of the sliding member. Final Act. 4. The Examiner finds that Kamiya teaches a sliding member “comprised of solid lubricant particles disposed in a resin” and where the “particles are oriented so that for the majority of the particles, the surface parallel to the major surface of the coating exhibit the same crystalline plane.” Final Act. 4 (citing Kamiya ¶¶ 17, 38). While Kamiya teaches use of MoS_2 , WS_2 , graphite, and boron nitride—and not CaF_2 —the Examiner finds “Kamiya teaches the specific method to accomplish the orientation of particles.” Final Act. 4 (citing Kamiya ¶¶ 3, 17, 30, 37). The Examiner also finds that Roy discloses that MoS_2 , WS_2 , graphite, boron nitride, and CaF_2 are all inorganic solids that are useful as lubricants. Final Act. 4 (citing Roy ¶ 154). And, even though CaF_2 is not a lamellar solid, the Examiner finds that Roy teaches CaF_2 has surfaces that slip easily and have a lubricating effect. Final Act. 4. “While Roy does not explicitly state which crystalline plane CaF_2 possesses this property [i.e., slips easily and has a lubricating effect], one of skill in the art would recognize that crystalline plane in question is the (111) crystalline plane, as evidenced by the teachings of Nabot and Gardo [sic].” *Id.* The Examiner finds Nabot teaches a preferred orientation of (111) for CaF_2 and layers that Gardos “discusses the tribological properties of the (111) face of CaF_2 , wherein the (111) face of a CaF_2 tribopin slides against the (111) face of a CaF_2 triboflat.” Final Act. 5 (citing Nabot 638 § 3.6; Gardos 355 § 3.4.1.2, 351, Fig. 192). Thus, the Examiner finds that “Kamiya modified by Roy would have a coating comprised of CaF_2 particles dispersed within a resin, wherein the particles are oriented so that for the majority of the particles, the surface parallel to the major surface of the coating would exhibit the (111)

crystalline plane.” Final Act. 5. The Examiner reasons that it would have been obvious to make these modifications to the sliding member of Mori because “Kamiya teaches that aligning the crystalline plane leads to lower coefficient of friction and increased seizure resistance (§ 0016).” *Id.*

First, Appellants argue that the Examiner’s rejection, *inter alia*, fails to establish a prima facie case of obviousness. Appeal Br. 7. Specifically, Appellants urge that the combination of references fails to teach “a peak intensity of a (111) plane of the calcium fluoride exposed on a sliding surface is larger than a peak intensity of a (220) plane.” *Id.* at 8. According to Appellants, Mori fails to teach orientation of CaF₂ particles in the resin and Kamiya does not teach CaF₂ particles at all. *Id.* at 9. Moreover, Kamiya discusses only lamellar particle alignment and because “CaF₂ particles are not lamellar and thus do not have a plate shape *Kamiya* does teach or otherwise suggest how non-plate-shaped particles, such as the claimed CaF₂, could be modified or aligned.” *Id.* at 9–10. Appellants contend that “[n]one of the other cited references, including *Roy*, *Nabot*, and *Cardo*, teaches or otherwise suggests CaF₂ particles that are processed or oriented such that a peak intensity of a (111) plane of the calcium fluoride exposed on a sliding surface is larger than a peak intensity of a (220) plane, as claimed.” *Id.* at 11.

Appellants’ arguments do not convince us that the Examiner has failed to establish a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) (“[The] [patent] examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability.”); *see also In re Jung*, 637 F.3d 1356, 1365–66 (Fed. Cir. 2011) (explaining that while “the applicant must identify

to the Board what the examiner did wrong . . . the examiner retains the burden to show invalidity”). As the Examiner finds above (*see supra* p. 3–4), Mori teaches a sliding member as claimed even if it does not teach the specific crystalline orientation of the CaF_2 on the surface of the sliding member. Final Act. 3–4. As to that, however, the Examiner aptly finds that Roy teaches CaF_2 particles are known solid lubricants that “*have surfaces that slip easily along one another at the molecular level*, thereby producing lubrication at the macroscopic level.” Roy ¶ 154 (emphasis added); *see also* Final Act. 4. The Examiner also finds that “while Roy does not explicitly state which plane of CaF_2 is the slipping plane, it is understood that *these would necessarily* be the (111) plane given the teachings of Nabot and Gardo [sic]. Namely, both references . . . state that the crystalline plane of CaF_2 exhibiting low friction (i.e. lubricating properties) is the (111) crystalline plane.” Ans. 11. And, the Examiner further explains that in the combination, “the particles are oriented so that for *the majority of the particles*, the surface parallel to the major surface of the coating would exhibit the (111) crystalline plane.” *Id.* at 5 (emphasis added); Ans. 5. Thus, we find that the Examiner has established a prima facie case of obviousness.

Appellants next argue that absent hindsight, “nothing in the scope and content of the prior art would provide any apparent reason for a skilled artisan to make the modifications necessary to arrive at the claimed invention.” Appeal Br. 14. Specifically, Appellants urge that “no compelling reason has been articulated as to how and why a person having ordinary skill in the art would modify conventional calcium fluoride

particles in a resin in the manner necessary to arrive at the claimed sliding member” *Id.*

We do not find Appellants’ arguments persuasive of reversible error because Appellants have failed to establish any deficiency as to the Examiner’s prima facie case. If the Examiner has articulated reasoning having rational underpinnings for making a proposed combination of prior art teachings, then that articulated reasoning supports a finding that the combination is not based on hindsight, absent a showing to the contrary. *Cf. In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”).

Further, even had Appellants been able to establish some error as to any or all of the references other than Mori and in the Examiner’s reliance on Nabot, the error would be harmless and not grounds to reverse the Examiner’s decision. *See Shinseki v. Sanders*, 556 U.S. 396, 409 (2009) (The burden of showing an error is harmful falls on Appellant). Here, Mori teaches a sliding member comprising a polyether ether ketone resin and a metal fluoride (CaF_2) in the claimed amount. Mori col. 1, ll. 8–10 and ll. 60–68, col. 2, ll. 15–18, and col. 3, ll. 1–7. Mori also teaches that metal fluoride, including CaF_2 , in amounts of 1–35% by weight is known to improve frictional properties and wear resistance. *Id.* at col. 3, ll. 10–14. Nabot teaches that CaF_2 is known for its “lubricating behavior” and that “[f]luorides such as CaF_2 and BaF_2 , whose friction coefficients are about 0.2–0.3, are frequently used as components in composite materials for reducing friction at higher temperatures (500–800 °C).” Nabot 629–630. Nabot also teaches that “the CaF_2 layers are cubic with a (111) preferred

orientation.” *Id.* at 629 and 632. Thus, Nabot reasonably teaches that the skilled artisan would have known to use CaF₂ having a (111) orientation “for enhancing the lubricating properties of mechanical devices.” *Id.* at 639. Further, in teaching that the (111) orientation is preferred for obtaining the desired benefit, Nabot reasonably teaches it would have been known to include greater levels of exposed CaF₂ on a sliding surface with a (111) orientation than with a (222) orientation, and also, that this would result in an accordingly greater (111) peak intensity. *Cf. In re Preda*, 401 F.2d 825, 826 (CCPA 1968) (In evaluating a reference, “it is proper to take into account not only the specific teachings of the reference but also inferences which one skilled in the art would reasonably be expected to draw therefrom.”).

We are not, accordingly, persuaded that the Examiner is relying on impermissible hindsight reasoning as the Examiner’s articulated reasons for combining the teachings of Mori, Kamiya, and Roy, as evidenced by Nabot or Gardos, are supported by the prior art disclosures themselves. *See, e.g., Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570 (Fed. Cir. 1996). Moreover, Appellants do not identify any knowledge relied upon by the Examiner that was gleaned only from the Appellants’ disclosure. *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971).

Lastly, Appellants contend that unexpected results rebut the Examiner’s prima facie case of obviousness, should a prima facie case be found to exist. Appeal Br. 20. According to Appellants, the inventive sliding member yields a “friction coefficient after 100 hours of operation in Comparative Ex. 1 and 2 far exceeds that of Ex. 1–13 (over 40% higher) . . . [and] the backside temperature after 100 hours in the sliding test

detrimentally and significantly increased in Comparative Ex. 1 and 2, by over 100%.” *Id.* at 21. Appellants argue that these results are unexpected and not suggested by the prior art. *Id.*

We do not find Appellants’ arguments persuasive of reversible error. The burden of showing unexpected results rests on the person who asserts them by establishing that the difference between the claimed invention and the closest prior art was unexpected. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972). The presence of unexpected results must be established by factual evidence; attorney statements are insufficient to establish unexpected results. *See In re Geisler*, 116 F.3d 1465, 1470–71 (Fed. Cir. 1997). As the Examiner explains, “there is nothing unexpected regarding lowering of coefficient of friction when the particles comprising a sliding member are oriented in such a way that the crystalline plane corresponding to a slipping plane is exposed more than another crystalline plane.” Ans. 15. Moreover, the Specification does not expressly describe the results of Table 1 as unexpected or surprising (Spec., generally). Rather, the Specification states that “the friction coefficients . . . are stably low within the range of 0.25 to 0.36” (Spec. 9 (emphasis added)) and only through attorney argument, do the results become unexpected. *See Geisler*, 116 F.3d at 1470–71.⁹

⁹ Appellants’ claims require a “polyether ether ketone.” Claims Appendix at Appeal Br. 23. Table 1 reports results comprising PEEK. Spec. 6. In the event of further examination, consideration should be given to whether the results of Table 1 are commensurate in scope with the degree of protection sought by the claims. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983).

CONCLUSION

The Examiner did not err in rejecting claims 1–6, under 35 U.S.C. § 103(a) over Mori, Kamiya, and Roy as evidenced by Nabot or Gardos.

DECISION

For the above reasons, the Examiner’s rejections of claims 1–6 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

AFFIRMED